TPS650352-Q1 Automotive Camera PMIC

1 Features

- Qualified for automotive applications
- Systematic capability of up to ASIL D and SIL 3 targeted
- Hardware integrity up to ASIL B and SIL 2 targeted
- Advanced diagnostics and protection
- AEC-Q100 grade 1 qualified
  - -40°C to +125°C ambient operating temperature range
- Three step-down converters:
  - BUCK1 V_{IN} range from 4.0V to 18.3V
  - BUCK1 V_{OUT} range from 2.5V to 4.0V
  - BUCK1 output current up to 1500mA
  - BUCK2 and BUCK3 V_{IN} range from 2.5V to 5.5V
  - BUCK2 and BUCK3 V_{OUT} range from 0.9V to 1.9V
  - BUCK2 output current up to 1200mA
  - BUCK3 output current up to 1200mA
  - Spread-spectrum clock (SSC) generation for reduced EMI
  - 2.3MHz forced fixed switching frequency PWM operation
- One low dropout (LDO) regulator:
  - V_{IN} range from 2.5V to 5.5V
  - V_{OUT} range from 1.8V to 3.3V
  - Low noise and high PSRR
  - Adjustable output voltage through I^2C
  - Up to 300mA output current
- 3.0mm × 3.5mm 22-pin WQFN with wettable flanks

2 Applications

- Automotive camera modules
  - Surround view camera modules
  - Rear view camera modules
  - Driver monitor camera modules
  - Power over coax (POC) camera modules
  - E-mirror camera modules
  - Front view camera modules

3 Description

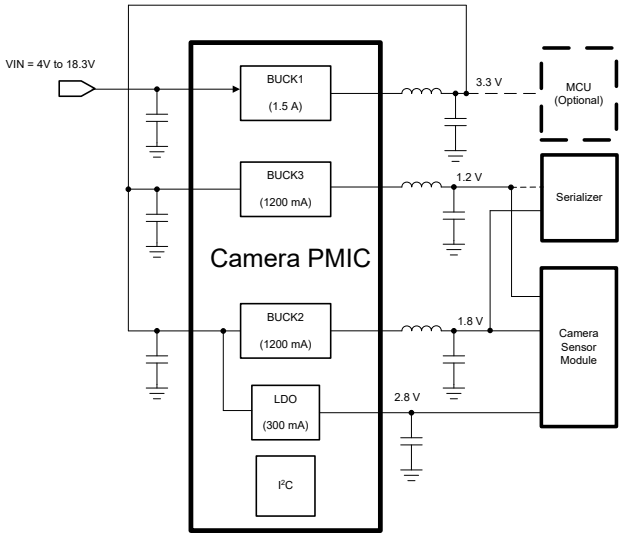
The TPS650352-Q1 device is a highly integrated power management IC for automotive camera modules. This device combines three step down converters and one low-dropout (LDO) regulator. The BUCK1 step-down converter has an input voltage range up to 18.3V for connections to Power over Coax (PoC). All converters operate in a forced fixed-frequency PWM mode. The LDO can supply 300mA and operate with an input voltage range from 2.5V to 5.5V. The step-down converters and the LDO have separate voltage inputs that enable maximum design and sequencing flexibility.

The TPS650352-Q1 is available in a 22-pin WQFN package (3.0mm × 3.5mm).

Package Information

PART NUMBER	PACKAGE(1)	BODY SIZE (NOM)
TPS650352-Q1	WQFN (22)	3.00mm × 3.50mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.



TPS650352-Q1 Application Circuit

4 Device and Documentation Support

4.1 Device Support

4.1.1 Third-Party Products Disclaimer

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4.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. Click on *Notifications* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

4.3 Support Resources

TI E2E™ support forums are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

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4.4 Trademarks

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4.5 Electrostatic Discharge Caution

This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

4.6 Glossary

TI Glossary	This glossary lists and explains terms, acronyms, and definitions.

5 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

DATE	REVISION	NOTES
November 2024	*	Initial Release

6 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
TPS6503520LRZDRQ1	ACTIVE	WQFN-FCRLF	RZD	22	3000	RoHS & Green	NIPDAU	Level-3-260C-168 HR	-40 to 125	O3520L	Samples

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".
RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.
Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

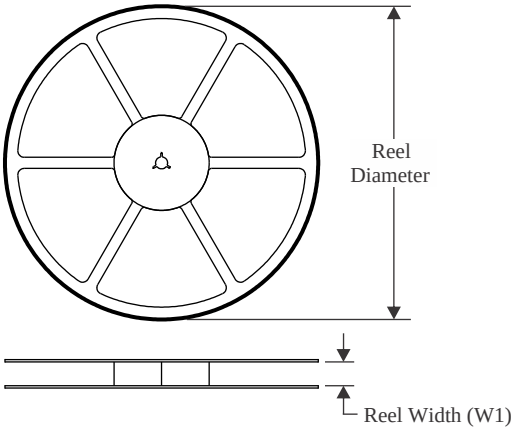
(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

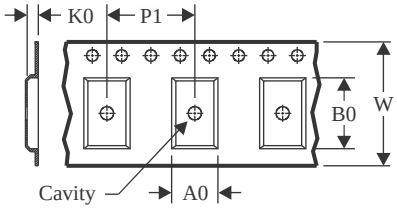
(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

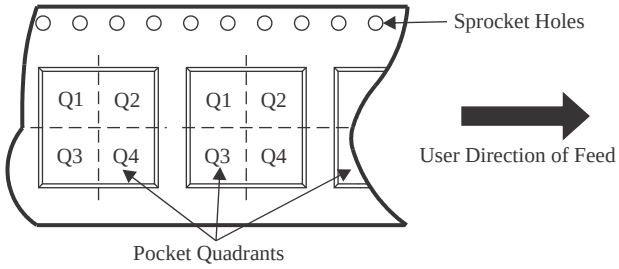


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

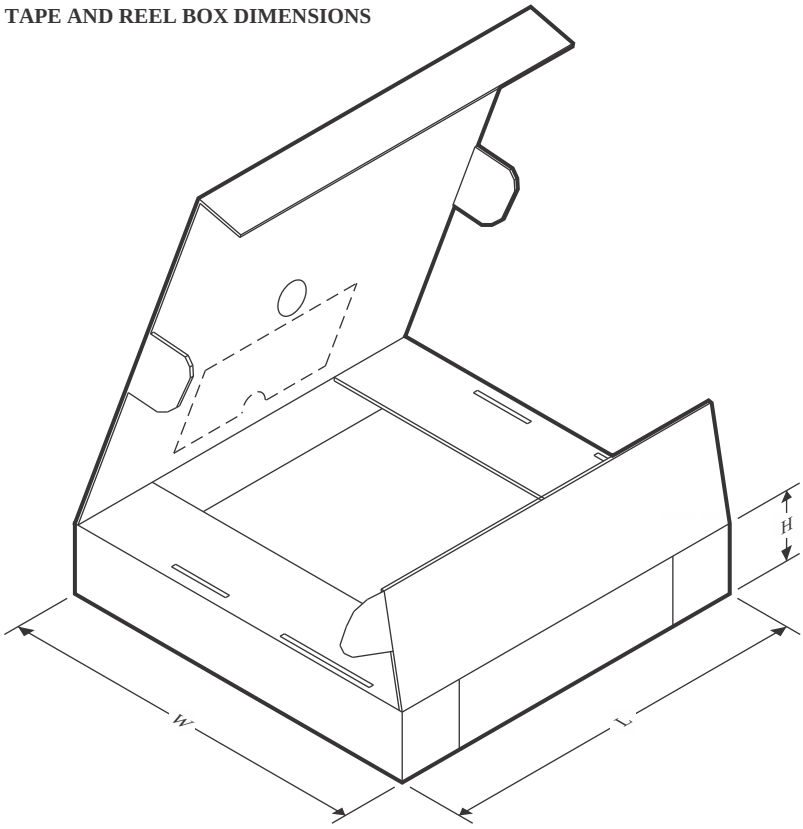
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TPS6503520LRZDRQ1	WQFN-FCRLF	RZD	22	3000	330.0	12.4	3.3	3.8	1.2	8.0	12.0	Q1

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPS6503520LRZDRQ1	WQFN-FCRLF	RZD	22	3000	367.0	367.0	35.0

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